

Winter Outlook: 2009/2010

Moderate El Niño Expected this Winter

Slightly drier and warmer than normal conditions across the Northern Rockies anticipated

SPOTTER INFORMATION CONTACTS

- Jenn Pallister
- Trent Smith

Phone: 406-329-4715

INSIDE THIS ISSUE:

WINTER OUTLOOK	1-3
SUMMER REVIEW	4
WEATHER STORY SPOTTER TRAINING	5-6
STAFF SPOTLIGHT USEFUL LINKS	7
WEATHER SEARCH COCORAHS	8 9
QUALITY CHECKING	10
SEARCH ANSWERS	10
CRITERIA	11
SPOTTER UPDATE FORM	12

El Niño/Southern Oscillation - Defined

The El Niño/Southern Oscillation (ENSO) is a major source of inter-annual climate variability in the Pacific Northwest (PNW). ENSO variations are more commonly known as **El Niño** (the warm phase of ENSO) or **La Niña** (the cool phase of ENSO).

An El Niño is characterized by warmer than average sea surface temperatures in the central and eastern equatorial Pacific Ocean, reduced strength of the easterly trade winds in the Tropical Pacific, and an eastward shift in the region of intense tropical rainfall ([Figure 1](#)).

A La Niña is characterized by the opposite – cooler than average sea surface temperatures, stronger than normal easterly trade winds, and a westward shift in the region of intense tropical rainfall. Average years, i.e., years where there is no statistically

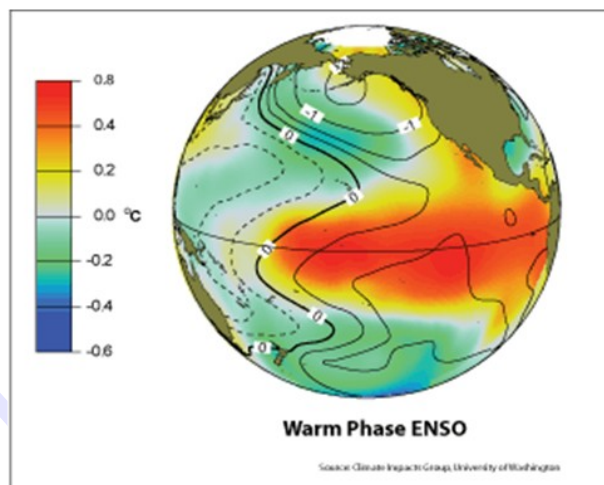


Figure 1 Warm Phase ENSO (El Niño). The spatial pattern of anomalies in sea surface temperature (shading, degrees Celsius) and sea level pressure (contours) associated with the warm phase of ENSO (i.e., El Niño) for the period 1900-1992. Contour interval is 1 millibar, with additional contours drawn for +0.25 and 0.5 millibar. Positive (negative) contours are dashed (solid).

significant deviation from average conditions at the equator, are called ENSO-neutral. Each ENSO phase typically lasts 6 to 18 months. ([Figure 2](#)).



EL NINO/SOUTHERN OSCILATION - DEFINED.....CONTINUED

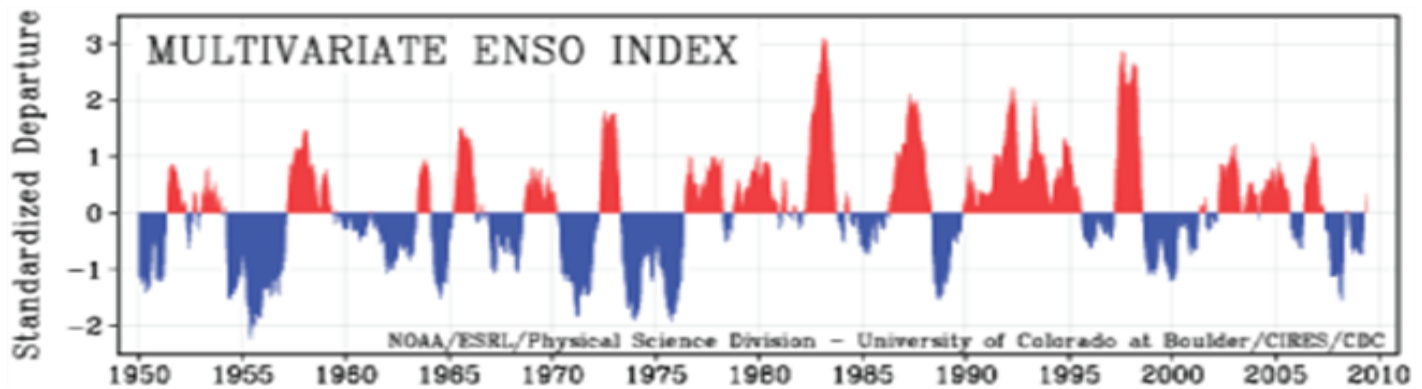


Figure 2 Multivariate ENSO index, 1950-2009. Positive (red) index values indicate an El Niño event. Negative (blue) values indicate a La Niña event. For information on the current status of ENSO, please see the [NOAA-CIRES Climate Diagnostics Center ENSO](http://www.noaa.gov/cires)

Although ENSO is centered in the tropics, the changes associated with El Niño and La Niña events affect climate around the world. ENSO events tend to form between April and June and typically reach full strength in December (hence the name El Niño, which is Spanish for “Little Boy” or “Christ Child”; La Niña means “Little Girl”).

There are certain teleconnections between El Niño events and variations in NR climate. El Niño winters, for example, tend to be warmer and drier than average with below normal snowpack and stream flow. It is important to note that weather is variable. Extreme cold events and big snow events occur most every winter, but over the en-

tire winter the averages during an El Niño are slightly warmer and drier.

These linkages and the availability of ENSO forecasts a few months to one year in advance of the event’s maturation provide resource managers opportunity to consider how a particular ENSO forecast may affect resource management choices.

Forecasting ENSO

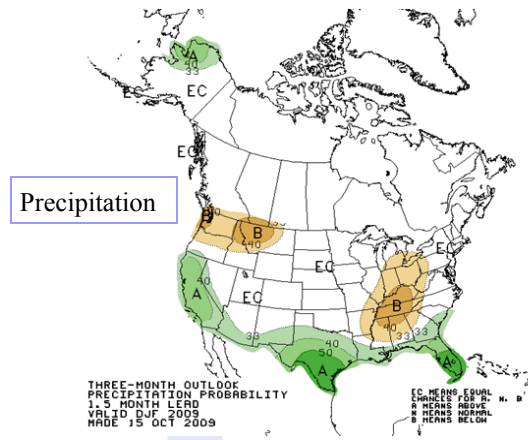
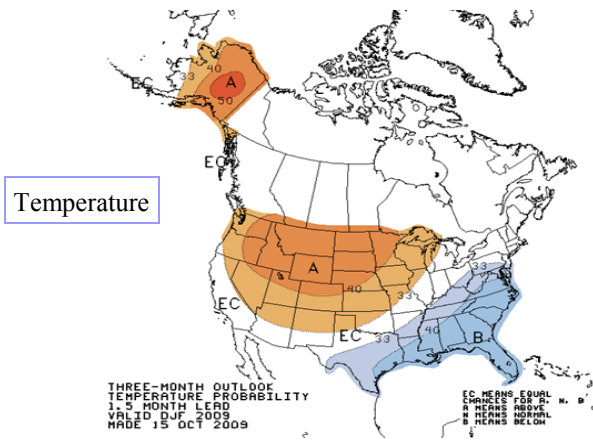
ENSO forecasts are derived from numerical prediction models using data collected by more than 400 deep ocean monitoring buoys distributed throughout the equatorial Pacific. These buoys, known collectively as the Tropical Atmosphere Ocean (TAO) array, provide real-time data of tropical Pacific ocean and climate conditions, including sea surface temperature, currents, and winds. ENSO forecasts are widely (and freely) available through dozens of forecasting centers around the world.



- Did you know we have a spotter’s blog?
- Check it out at <http://www.wrh.noaa.gov/mso/spotterblog>

EL NINO/SOUTHERN OSCILATION - DEFINED.....CONTINUED

The following graphs are the 3 month outlooks for the months Dec-Jan-Feb for the U.S. This link can be found at www.cpc.noaa.gov The forecast calls for slightly above normal temperatures and



slightly below normal precipitation possible.

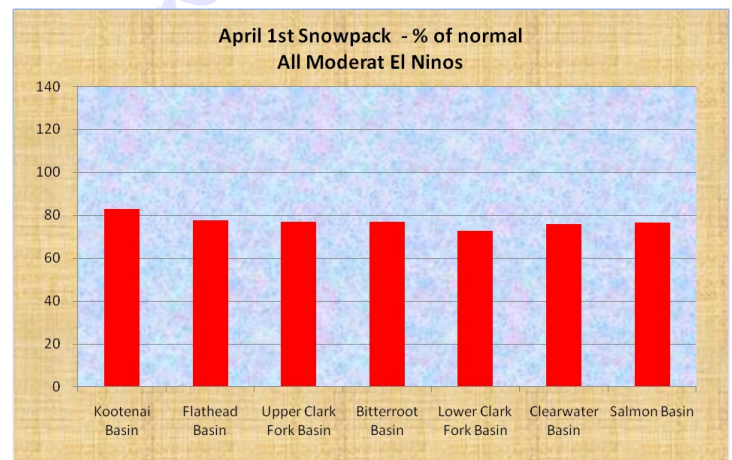
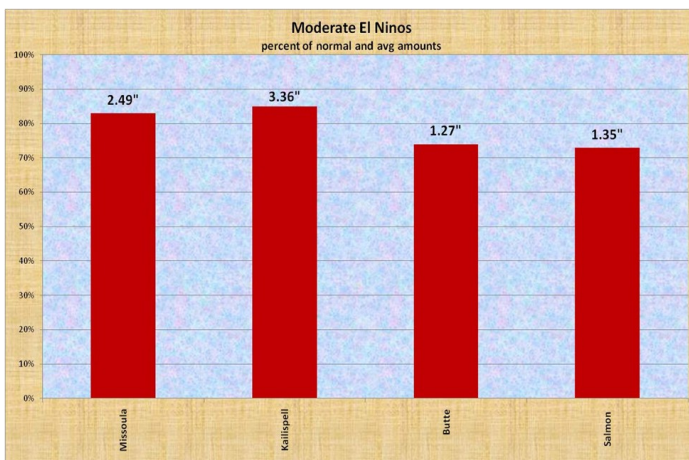
The following is a summary of average winter temperatures, precipitation, and snowfall for Missoula, Butte and Kalispell. Temperatures are in terms of degrees F, and precipitation/snowfall are in terms of inches.

	November			December			January			February		
	Max/Min	Precip	Snow	Max/Min	Precip	Snow	Max/Min	Precip	Snow	Max/Min	Precip	Snow
Missoula	39.9/24.1	0.95	6.2	30.5/17.0	1.09	11.2	31.2/16.8	0.92	11.3	37.3/20.4	0.70	7.0
Kalispell	38.7/23.7	1.36	8.1	29.9/16.2	1.62	13.9	29.5/15.2	1.36	12.6	35.1/18.1	1.04	8.3
Butte	39.2/15.0	0.59	M	30.2/6.0	0.50	M	30.6/5.9	0.47	M	34.9/9.3	0.45	M

Table: 1977-2007 Average Monthly Maximum Temperature, Minimum Normal and Precipitation

The following 2 graphs show the percent of normal precipitation and snowfall for Missoula, Kalispell, Butte and Salmon and percent of snowfall in various basins in western Montana and central Idaho.

Note that precipitation is typically around 75-85 percent of normal during moderate El Nino years with snowfall around 80 percent of normal.



SUMMER IN REVIEW

Needless to say, the summer of 2009 was quite unusual, not just in the Northern Rockies, but across the entire country! One of the big players in causing this rare cool and rainy summer was the presence of El Nino, previously discussed in the winter outlook article. Because of the cool temperatures and a couple of well timed precipitation events, fire season was generally kept at bay across the Northern Rockies for yet another summer. Below is a summary of a few significant weather events which occurred across Western Montana and North Central Idaho.

August 6-7th, 2009 — A strong low pressure system and associated cold front moved through the Northern Rockies, creating a favorable environment for severe thunderstorms to develop. Flash flooding, damaging winds, and very large hail accompanied a few of these storms, particularly in Lemhi County, Idaho and across Southwest Montana into the Butte area. Hail up to 2.5" in diameter fell south of Butte, causing damage to trees, roofs and windows. In addition, an inch plus of precipitation fell in the city of Butte and over Highway 93 in Lemhi County, causing



Flooding on Lemhi River — August 2009

flash flooding that damaged roads and flooded a few home basements. Butte set a record rainfall for this date. Although the strongest storms mainly affected Lemhi City and southwest Montana, a large area of wrap around precipitation brought 2.03" of rain to Missoula, also setting a daily rainfall record. This one day total was more than double what is normally expected to fall during the entire month of August in Missoula!

July 26-28th, 2009 — A rare cut off low pressure system brought rain to much of the Northern Rockies and strong thunderstorms across Southwest Montana. Precipitation amounts with this event were up to an inch across the higher terrain of Northwest Montana. Just about all locations saw at least a wetting rain with this system, which is rare to occur in late July.

August 14-15th, 2009 — A cold Pacific storm system passed through Western Montana and North Central Idaho, causing snow levels to lower down to about 6500 feet! Snow amounts ranging between a trace and 2" impacted the higher terrain of Western Montana. In addition, significant rainfall impacted North Central Idaho, with 1-1.5" of rain.

August 20th-21st, 2009 — The summer wasn't entirely filled with cold and wet conditions. A strong ridge of high pressure formed over the Pacific Northwest during this timeframe, bringing record breaking to near record breaking temperatures to much of the region. Butte, MT set a daily record maximum temperature of 92 degrees on the 21st, with a few locations approaching the century mark!

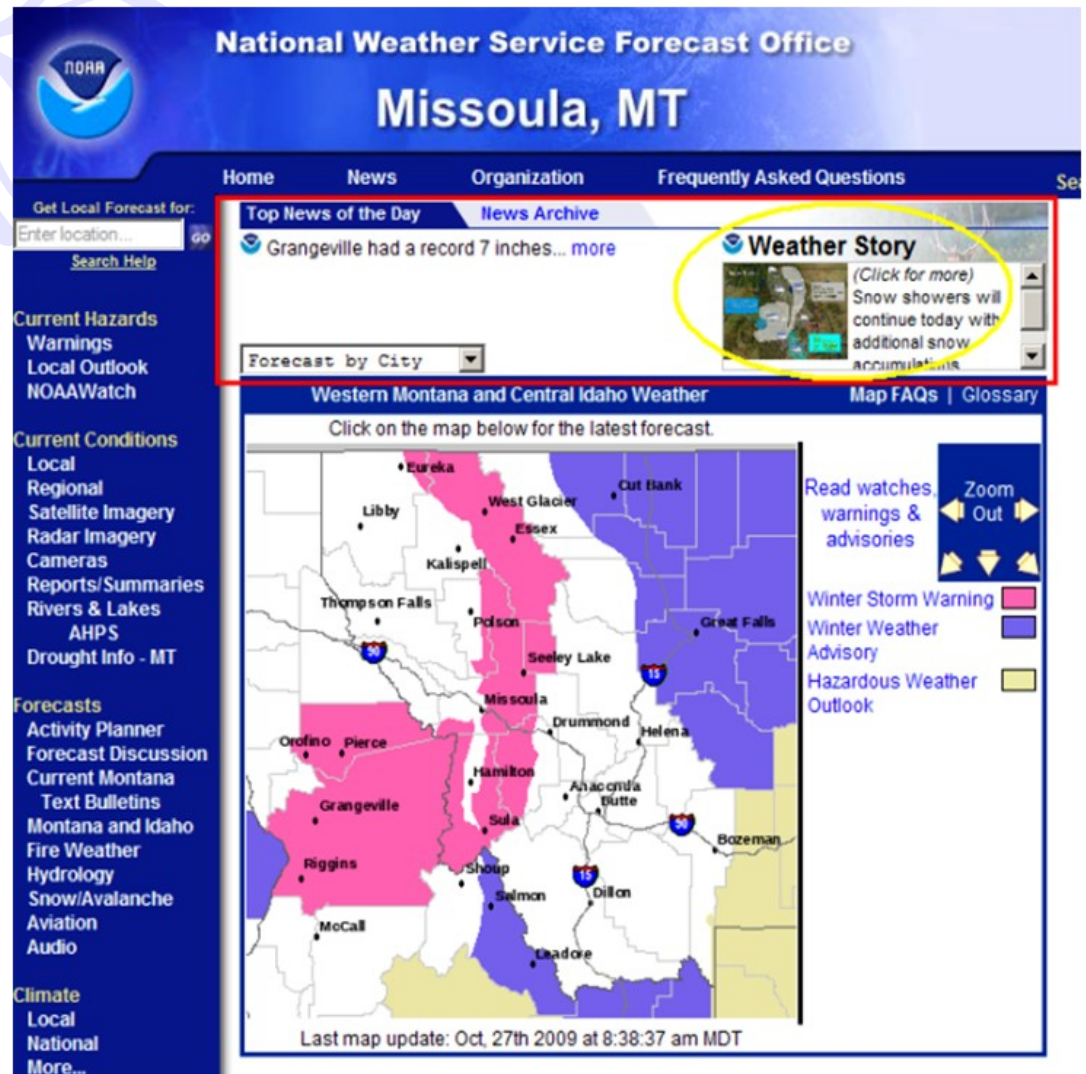
WEATHER STORY

The National Weather Service has developed a new product to help convey pertinent weather, water and climate impacts through an easy to read graphical summary called the Weather Story. Although the Weather Story is not currently issued on a daily basis, it can be found at the top of our webpage anytime critical weather is occurring, or is expected to occur over the next seven days, in western Montana and north central Idaho. Below is a graphic displaying where the weather story link will be highlighted on our website

(www.weather.gov/missoula).

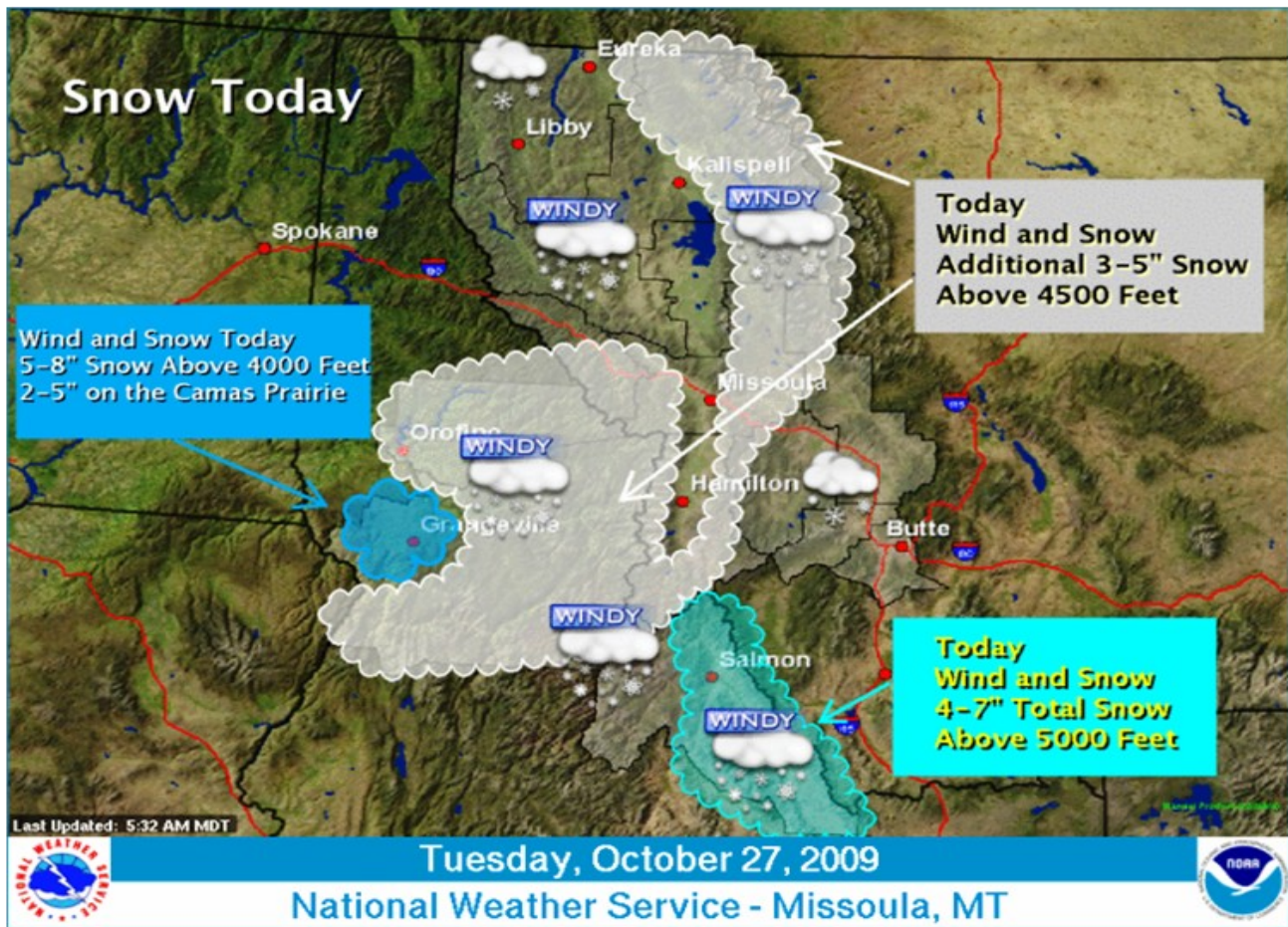
The Weather Story is intended to be a one stop shop for your weather impact needs. It will include a description of the weather scenario coming in to play, as well as a graphic displaying where issues

such as snow, cold temperatures, record heat, heavy rain, severe thunder-



storms, may impact your daily life. This product is easy to read and interpret and is a great way to get a quick feel, or over-view, of incoming weather impacts.

The National Weather Service continues to modify this product in order to best suit your needs, therefore suggestions and comments are welcome! Please direct suggestions to the following web-site: <http://www.weather.gov/survey/nws-survey.php?code=wrh-wsd>



Example of a Weather Story produced for a snow storm over western Montana and north central Idaho October 27th, 2009.

SPOTTER TRAINING SESSIONS



We will be holding several spotter training sessions throughout our service area this winter and spring. If you know of anyone from the regions listed in the schedule below, that may be interested, please invite them to the upcoming training sessions. Details on the times and locations will be sent in the mail in the coming months. The training sessions are primarily held at the local school or public library. Thank you for your dedication and efforts towards providing the public with critical weather information.

January 27th – Hamilton

February 18th – St. Regis

March 4th – Butte

April 20th – Grangeville

April 21st - Orofino

STAFF SPOTLIGHT

Name: **Bruce Bauck**

Position: **Meteorologist in Charge**

Hometown: **Portland, Oregon**

National Weather Service Background:

Bruce volunteered his time in Portland Oregon. He was given a Student Career Experience Program position in Los Angeles, California. Bruce held an intern position in Seattle, Olympia and Helena, MT. Bruce was hired as a Journey Forecaster in Pendleton Oregon. He was promoted to the Warning Coordination Manager in Pocatello Idaho. Bruce became the Meteorologist in Charge at Pendleton Oregon, then transferred to Missoula Montana. He has worked for the National Weather Service upwards of 24 years.

Why did you want to become a Meteorologist?

My desire for the meteorologist started with my dad who was very interested in severe weather. Since a kid in grade school, I recorded daily precipitation and constantly monitored weather, especially during storms. Overall, the complexity and uncertainty of weather forecasting and climate over small areas has been a challenge that sparked my interest as a young kid and driven my passion for the field to this day.

USEFUL LINKS

www.weather.gov – National Weather Service
www.ncep.noaa.gov – National Centers for Environmental Prediction
www.rap.ucar.edu/weather – The National Center for Atmospheric Research
www.meteo.psu.edu/~gadomski/ewall.html – Penn State Weather Wall
www.spc.noaa.gov – Storm Prediction Center
www.ncdc.noaa.gov – National Climatic Data Center
www.wrcc.dri.edu – Western Regional Climate Center
www.cpc.noaa.gov – Climate Prediction Center
www.srh.noaa.gov/gis/kml – Google Earth Maps
www.nhc.noaa.gov – National Hurricane Center
www.cocorahs.org – Community Collaborative Rain, Hail and Snow Network
www.mdt.mt.gov/travinfo – Montana Department of Transportation
511.idaho.gov – Idaho Transportation Department
amsglossary.allenpress.com – American Meteorological Society Glossary of Meteorology
aa.usno.navy.mil – Astronomical Applications Department (Sunrise/Sunset)
earthquake.usgs.gov – USGS Earthquake Center

What are some of your responsibilities in the office?

The Meteorologist in Charge (MIC) bears overall responsibility for ensuring the responsiveness and technical soundness of the warning and forecast programs and services in western Montana and north central Idaho meet

customer and public needs. The MIC serves as local interface between NWS and its customers and partners to determine requirements and measure service satisfaction. It also requires the MIC to establish an internal system of reviewing the technical quality of Weather Forecast Office (WFO) services.

The MIC is also responsible for ensuring the application of the latest advances in the science and information technology systems to WFO operations and services.

The MIC is responsible for managing the WFO workforce, scheduling and assigning their work, evaluation performance and making selections for all WFO positions. The MIC makes sure the NWS staff are provided with effective guidance and coaching to perform their jobs.



Bruce Bauck, MIC

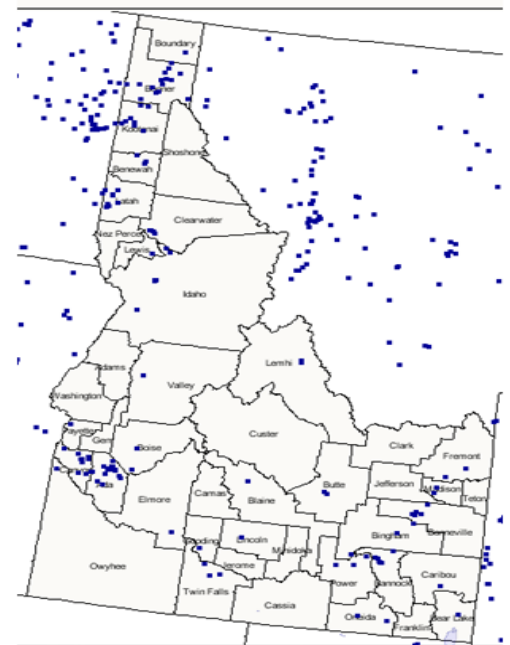
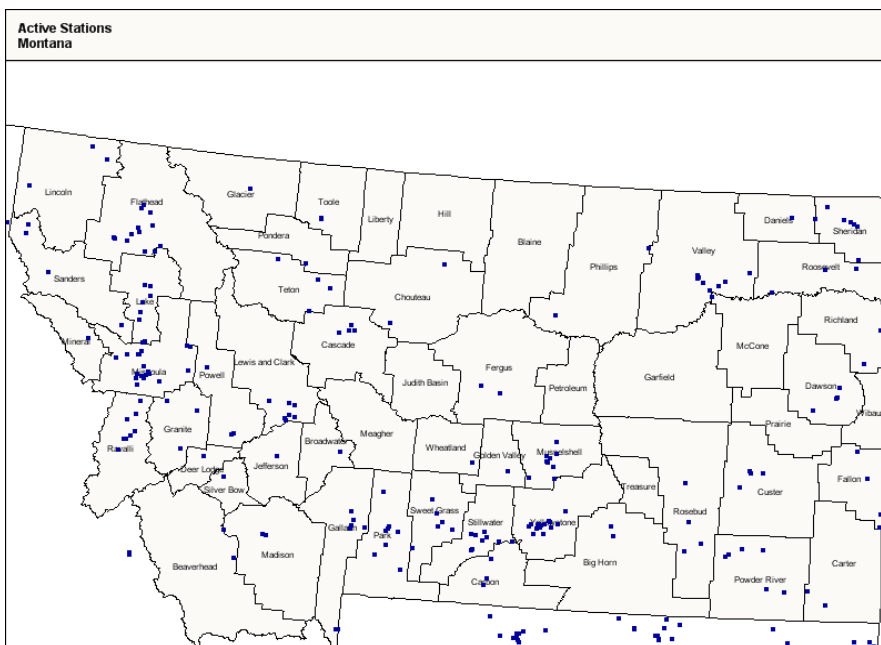
WEATHER SEARCH

T E E A G V S I D H A D A M G A J P P A D T N A X C W M E Y
 R D R N D K B U X Z I G R P Z T E C E I L I N G M I P R V G
 O N E E T T F P P F N E C M G J N H D G N B T A N R R O A O
 P O H N H R K A F E T B A G O D N U S A R P E V W R E T P L
 O S P H S P A U H E R M V K S X U L K Z C R J D K U C S O O
 S O S E I A S I M R M C N O I T A S N E D N O C O S I R R R
 P I O O R I G O N A E O O F R O N T O G E N E S I S P E A O
 H D M F O E R E T M D N I O K C Q A T G O O L C H I I D T E
 E A T N K H T U O A E U H P L J H N T I N E Y Y H N T N I T
 R R A F C G S E N S R N T E Q E E I T U N C D Z U S A U O E
 E R L Y X Q W R M U T T T C I C D C N T L R L L M O T H N M
 K R S B B O O P E O C A S G U T E I I O O L L X I L I T Q S
 S P N D P T B F G B M O T L N V H C N P O A O P D A O S I U
 S U B L I M A T I O N E I I N I U E H J T K N P I T N V J B
 E C N E G R E V N O C T N O O L N O D E P O S I T I O N T S
 X B S C U K A N O A C E C A A N B T N R I J P Q Y O B R N I
 P R J P N N J K O O D Y R R L I A T H T Z S V N S N A G A D
 R A B I L L I M N L R I I U C A U R A G D N O U N N V D Y E
 E M I S S I V I T Y C W A L S C N R Y R I I J T S W V C T N
 E C N E C S E D I R I Y C B L S U R A Z T L C P H E V C I C
 E C O A L E S C E N C E C I A T E Z E A D I I G C E D L L E
 T S R U B N W O D D W M M O A T Z R I V T R A T N L R I I H
 Y A J O P Y O J R C O A E S S I I D P P A Q I F O A A M B U
 Q A W N K X X O S G T L O S L E A C O T E O I Y I M W A A T
 C O R I O L I S S O R J D B Q R M N I Q N H S Z S R D T T L
 Q M A Q D Y Z D L N T A H R Z H Y O I W V E O O U E N E S V
 F O S M H N G O L R O W B V U S N C I T E N I K L H I H T H
 R M J G O T G E L P A M K T R M Z D A W S C T E C T W R D F
 I R T Q H Y V O R T I C I T Y K S B T L Z O M I C Z W F T J
 Y E K A L F W O N S W E A T H E R C I H P A R G O R O Q W B

ADIABATIC	ADVECTION	ALBEDO	ANEMOMETER
ATMOSPHERE	BLIZZARD	CEILING	CHINOOK
CIRRUS	CLIMATE	CLIMATOLOGY	COALESCENCE
CONDENSATION	CONVECTION	CONVERGENCE	CORIOLIS
CYCLONE	DEPOSITION	DIFFUSION	DOLDRUMS
DOWNBURST	EMISSION	ENTRAINMENT	EVAPORATION
FAHRENHEIT	FOEHN	FRONTOGENESIS	GEOSTATIONARY
HUMIDITY	HYDROPHOBIC	INSOLATION	IRIDESCENCE
ISOTHERMAL	KINETIC	LATENT	LENTICULAR
LIGHTNING	MAMMATUS	MESOCYCLONE	METEOROLOGY
MILLIBAR	MONSOON	NOCTILUCENT	OCCCLUSION
OROGRAPHIC	POLLUTANTS	PRECIPITATION	PRESSURE
PSYCHROMETER	RADIATION	RADIOSONDE	SATURATION
SNOWFLAKE	STABILITY	STRATOSPHERE	SUBLIMATION
SUBSIDENCE	SUNDOG	SUPERCOOLED	SYNOPTIC
THERMAL	THUNDERSTORM	TORNADO	TRANSPIRATION
TROPOSPHERE	VERNAL	VORTICITY	WEATHER

Cuckoo for CoCoRaHS

The National Weather Service extends our warmest thanks to the CoCoRaHS observers for their excellent efforts this past year and continues to seek new volunteers. CoCoRaHS, the Community Collaborative Rain, Hail and Snow Network, continues to grow as a “grassroots” program in the Northern Rockies and has spread across the nation. Later this year, Minnesota will be the final state added to the program. CoCoRaHS came to Montana in January of 2007. Currently, we have 224 observers across the Treasure State. In December 2008, Idaho joined the network and continues with 118 observers. As you can see by the station maps of Idaho and Montana, we have quite a few areas, and even entire counties, without observers. We continue to search for new observers in all areas but are particularly hoping to fill in the holes on the map. The excellent team at CoCoRaHS headquarters in Fort Collins, Colorado continues to expand the website and find new ways to stay connected. Observers can become a friend of CoCoRaHS on facebook. You can also follow the CoCoRaHS blog at <http://cocorahs.blogspot.com>. Observers in Montana can join the google group MT-CoCoRaHS. In addition, Nolan Doeskan writes an e-mail entitled “Catch” to all observers twice a month. If you are interested in becoming part of this “unique, non-profit, community-based network of volunteers of all ages and backgrounds”, please visit www.cocorahs.org. If you have not looked into the program, we encourage you to take a look at the website to find information on the program, as well as all training materials for observing and recording precipitation and videos on how to measure snow. We are planning on hosting an online training this coming spring, so watch your email for the date and time. The data collected is valuable, and we appreciate those of you who participate in the network.



Quality Checking and Last Mass Mailing

The National Weather Service in Missoula is currently updating our spotter contact information and collecting email addresses from our spotters. To aide us in this process, we appreciate your efforts to print the last page of this newsletter titled Severe Weather Spotter Information and return it to the office. Also, the Missoula Weather Service will no longer provide mass mailing of postcard notification for future newsletter publications due to the increase in postage and number of returned cards. We will transition to email notification beginning with the Spring 2010 Newsletter. If you have requested a hard copy of the newsletter, we will continue mailing those to you. We appreciate your efforts as we collect this information.

Answer Key for Weather Word Search

Weather

T	E	E	A	G	V	S	I	D	H	A	D	A	M	G	A	J	P	P	A	D	T	N	A	X	C	W	M	E	Y	
R	D	E	N	D	K	B	X	Z	I	G	K	P	Z	T	E	C	E	I	L	I	N	G	M	I	P	R	V	G		
O	N	E	E	T	T	F	P	R	F	N	E	C	M	G	J	N	H	D	G	N	E	T	A	N	R	R	O	A	O	
P	O	H	N	H	R	K	A	E	E	T	B	A	G	O	D	N	U	S	A	R	P	E	V	W	R	E	T	P	L	
O	S	P	H	S	P	A	H	E	R	M	V	K	S	X	U	L	K	Z	C	R	J	D	K	U	C	S	O	O		
S	O	S	E	I	A	S	I	M	R	M	C	N	O	I	T	A	S	N	E	D	N	O	C	Q	S	I	R	R	R	
P	I	O	O	R	I	C	E	N	A	E	O	O	F	R	O	N	T	O	G	E	N	E	S	I	S	P	E	A	O	
H	D	M	H	O	E	R	E	E	M	D	N	I	O	K	S	Q	A	T	G	O	O	L	C	H	I	I	D	T	E	
E	A	T	M	K	H	T	U	O	A	E	U	N	P	L	J	H	N	T	I	N	E	Y	X	H	N	T	N	I	T	
R	R	A	F	C	G	S	E	N	S	R	N	T	E	Q	E	E	I	T	U	N	C	D	Z	U	S	A	U	O	E	
E	R	L	Y	X	Q	W	R	M	U	T	T	C	I	C	C	N	T	E	R	L	L	M	O	T	H	N	M			
K	R	S	B	B	O	O	P	E	O	C	A	S	S	U	T	E	I	I	B	O	L	L	X	I	L	I	T	Q	S	
S	P	N	D	P	T	B	F	G	B	M	O	T	L	N	V	H	C	M	P	O	A	Q	P	D	A	O	S	I	U	
S	U	B	L	I	M	A	T	I	O	N	E	I	I	N	I	U	E	H	J	T	K	N	R	I	T	N	V	J	B	
E	C	N	E	G	R	E	V	N	O	E	T	N	O	O	L	N	O	D	E	P	O	S	I	T	I	O	N	T	S	
X	B	S	C	U	K	A	N	O	A	C	E	Z	A	A	N	E	T	N	R	X	J	P	Q	Y	O	B	K	N	I	
P	R	J	P	N	N	J	K	O	O	D	Y	R	R	L	I	A	T	H	T	Z	S	V	N	S	N	A	G	A	D	
R	A	D	I	L	L	I	M	N	L	R	I	U	Z	A	U	R	A	G	O	N	O	U	N	N	V	D	Y	E		
E	M	I	S	S	I	V	I	T	Y	C	W	A	L	S	C	N	R	X	K	R	I	I	J	T	S	W	V	C	T	N
E	C	N	E	C	S	E	D	I	R	I	Y	C	B	L	S	U	P	A	Z	T	L	C	P	H	E	V	C	I	C	
E	C	O	A	L	E	S	C	E	N	C	E	C	I	A	T	E	Z	E	A	D	I	I	G	C	E	D	L	L	E	
T	S	R	U	B	N	W	O	D	D	W	M	M	O	A	T	Z	R	I	V	T	R	A	T	N	L	R	I	I	H	
Y	A	J	O	P	Y	Q	J	R	C	O	A	E	S	S	I	I	D	R	P	A	Q	I	F	O	A	A	M	B	U	
Q	A	W	N	K	X	X	O	S	G	T	L	O	S	L	E	A	C	O	T	E	O	I	Y	I	M	W	A	A	T	
E	O	R	I	O	L	I	S	S	O	R	J	D	B	Q	R	M	N	I	Q	N	H	S	Z	S	R	D	T	T	L	
Q	M	A	Q	D	Y	Z	D	L	N	T	A	H	R	Z	H	Y	O	I	W	V	E	O	O	U	E	N	E	S	V	
F	O	S	M	H	N	G	O	L	R	O	W	B	V	U	S	M	C	I	T	E	N	I	K	L	H	I	H	T	H	
R	M	J	G	O	T	G	E	L	P	A	M	K	T	R	M	Z	D	A	W	S	C	T	E	C	T	W	R	D	F	
I	R	T	Q	H	Y	V	O	R	T	I	C	I	T	Y	K	S	B	T	L	Z	O	M	I	C	Z	W	F	T	J	
Y	E	K	A	L	F	W	O	N	S	W	E	A	T	H	E	R	C	I	H	P	A	R	G	O	R	O	Q	W	B	



National Weather Service

Missoula Montana

Spotter Network Reporting Procedures



When you observe or hear of weather conditions that meet or exceed the criteria listed below, telephone your report immediately to the National Weather Service office in Missoula. Our toll-free number is:

1-800-676-6975*

- **High Wind:** 40 mph or more sustained or gusts. (Please use table below to estimate wind speeds.)
- **Heavy Snow:** Snowfall rates of one inch or more per hour. 6 inches in 12 hours or 8 inches in 24 hours.
- **Dangerous Wind Chills:** Minus 10 degrees or colder (Please use table below to estimate wind chills)
- **Freezing Rain:** Falls as rain, freezes on contact
- **Visibility:** less than ¼ mile for any reason (e.g. dense fog, smoke)
- **Heavy Rain:** ½ of an inch or more per hour
- **Flooding:** any kind (e.g. rivers/streams abnormally high, water over roads, debris flows, ice jams)
- **Damage, Injuries and/or Death** that were weather related
- **Hail:** Any size (Please use table below to estimate hail size)
- **Tornado** (cloud to ground), **Funnel Cloud** (not touching the ground) or **Waterspout** (over water)
- **Unforecasted Weather**

When calling in your report, please tell us briefly:

- **Who you are and where you are calling from**
- **What you have seen** (hail, high winds, heavy snow, etc.)
- **Where you saw it** (i.e. 4 miles West of Missoula)
- **When you saw it** (the time of your observation)
- **What it was doing** (movement, damage observed, trend – i.e. snowfall is becoming heavier, etc.)

* Unlisted number, **ONLY** for weather reporting

Wind Speed Estimates (MPH)

- 25-31 Large branches in motion
- 32-38 Whole trees in motion
- 39-46 Twigs break off tree;
wind impedes walking
- 47-54 Slight structural damage;
branches break
- 55-63 Trees uprooted;
severe structural damage
- 64-74 Widespread damage
- 75+ Devastation



NWS Windchill Chart



		Temperature (°F)																	
		40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
Wind speed (mph)	5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
	10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
	15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
	20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
	25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
	30	28	22	15	8	1	-6	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
	35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
	40	27	20	13	5	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
	45	26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
	50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-59	-66	-73	-80	-87	-94
	55	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
	60	25	17	10	3	-4	-11	-19	-26	-33	-40	-47	-55	-62	-69	-76	-84	-91	-98
		Possible Times																	
		10 minutes																	
		1 hour																	
		5 minutes																	
		1 minute																	
		10 seconds																	
		1 second																	
		100 microseconds																	
		10 microseconds																	
		1 microsecond																	

Wind Chill (°F) = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275(TV^{0.16})

Where: T=Air Temperature (°F), V=Wind Speed (mph)

Where: T=15

$$\text{Wind Chill (°F)} = 35.74 + 0.6215T - 35.75V^{0.16} + 0.4275TV^{0.16}$$

Where T is Air Temperature (°F) and V is Wind Speed (mph)

(Where T is °C)

Hail Size Estimates (Inches)

- Pea.....1/4
- Penny.....3/4
- Nickel.....7/8
- Quarter.....1
- Half Dollar.....1 ¼
- Ping Pong.....1 ½
- Golf Ball.....1 ¾
- Egg.....2
- Tennis Ball.....2 ½
- Baseball.....2 ¾
- Tea Cup.....3
- Softball.....4 ½



**NATIONAL WEATHER SERVICE
MISSOULA MONTANA**

Severe Weather Spotter Information

NAME AND HOME ADDRESS

MAILING ADDRESS (If Different Than Home)

Official Use Only

Latitude: _____

Elevation: _____

Longitude: _____

Specific Add: _____

PHONE NUMBER(S) (HOME /OFFICE/CELL) WHERE YOU CAN BE REACHED DURING SEVERE WEATHER

HOURS OF THE DAY OR NIGHT THAT WE CAN CONTACT YOU IN CASE OF SEVERE WEATHER

EMAIL: _____

PLEASE PLACE AN "X" BY ANY OF THE FOLLOWING THAT APPLY

_____ I NEED A RAIN GAUGE.

_____ I HAVE A HAM RADIO AND MY CALL SIGN IS: _____.

_____ I HAVE THE FOLLOWING WEATHER EQUIPMENT LISTED BELOW

_____ I AM INTERESTED IN BECOMING A CoCoRaHS OBSERVER

_____ I AM INTERESTED IN BECOMING A SNOWFALL REPORTER

PLEASE COMPLETE AND RETURN TO:

NATIONAL WEATHER SERVICE

ATTN: SEVERE WEATHER SPOTTER NETWORK

6633 AVIATION WAY

MISSOULA MT 59808